

**REMARKS**

Claims 1-7, 11-16 and 49-63 are pending. Claims 8-10 and 17-48 are canceled. Claims 49-63 are new.

Claim 1 is amended. Claims 3-7 and 16 were previously amended.

Support for the current amendment to claim 1 may be found, for example, in Examples 4 and 5 and Figure 3 of the specification. Five embodiments of the current invention are disclosed as recombinant gene constructs in Example 4 and demonstrated to synthesize farnesyl diphosphate having a shorter chain length than the native gene when transformed into *E. coli* as disclosed in Example 5 and Figure 3 of the specification. Col. 12, line 1 through Col. 14, line 16.

The Examiner has established in paragraph [3] of the August 22, 2006 Office Action that claims 1 to 16 and 33 to 48 were pending as of the Amendment with RCE filed June 2, 2006. In view of the Examiner's establishment of the proper claim numbering in this application, new claims in this response begin with claim 49 and continue through claim 63. Applicants respectfully submit the claim numbering is now in order.

Support for new claim 49 may be found, for example, at column 6, lines 48 and 49, in Example 4, and in the disclosure of SEQ ID NO: 9 in Example 4.

Support for new claim 50 may be found, for example, at column 6, lines 51 and 52, in Example 4, and in the disclosure of SEQ ID NO: 10 in Example 4.

Support for new claim 51 may be found, for example, at column 6, lines 53 through 55, in Example 4, and in the disclosure of SEQ ID NO: 11 in Example 4.

Support for new claim 52 may be found, for example, at column 6, lines 56 through 58, in Example 4, and in the disclosure of SEQ ID NO: 12 in Example 4.

Support for new claim 53 may be found, for example, at column 6, lines 59 through 63, in Example 4, and in the disclosure of SEQ ID NO: 13 in Example 4.

Support for new claim 54 may be found, for example, at column 4, line 60 through column 5, line 7; column 5, line 66, through column 6, line 21; Example 2, in column 10; Example 4, in column 12; and, in Figure 1.

Support for new claims 55 through 57 may be found, for example, in Examples 1 through 5 of the specification, which provide the processes of the claims and nucleic acid constructs of the claims. New claims 55 through 57 correspond to original claims 11, 15 and 16, respectively, and have been changed to depend from new claim 54.

Support for new claim 58 may be found, for example, at column 4, line 60 through column 5, line 7; column 5, line 66, through column 6, line 21; column 6, lines 59 through 64; Example 2, in column 10; Example 4, in column 12; and, in Figure 1.

Support for new claims 59 through 61 may be found, for example, in Examples 1 through 5 of the specification, which provide the processes of the claims and nucleic acid constructs of the claims. New claims 59 through 61 correspond to original claims 11, 15 and 16, respectively, and have been changed to depend from new claim 58.

Support for new claim 62 may be found, for example, at column 4, line 60 through column 5, line 7; column 5, line 66, through column 6, line 21; Example 2, in column 10; Example 4, in column 12; and, in Figure 1.

Support for new claim 63 may be found, for example, at column 4, line 60 through column 5, line 7; column 5, line 66, through column 6, line 21; column 6, lines 59 through 64; Example 2, in column 10; Example 4, in column 12; and, in Figure 1.

The following remarks in response to the Examiner's claim objections and claim rejections in the August 22, 2006 Office Action are provided in support of the above-amended and newly presented claims. For the Examiner's convenience, the heading of each set of remarks is numbered in accordance with the paragraph numbering provided by the Examiner in the August 22, 2006 Office Action.

Please note that that the correct Attorney Docket No. for this application is "77670/593."

**[9] Objection to Claims 8 and 33—Underlining of SEQ ID NO:1**

The Examiner has objected to claims 8 and 33 because SEQ ID NO:1 was added by amendment but not underlined. Claims 8 and 33 have been canceled. As such, Applicants respectfully request the Examiner withdraw this objection.

**[10-12] Rejections for Indefiniteness—Withdrawn**

Applicants thank the Examiner for withdrawing the rejections of claims 1 to 32 for indefiniteness.

**[13] Rejection of claims 1 to 16 and 33 to 48—Written Description**

The Examiner has rejected claims 1 to 16 and 33 to 48 for lack of written description. Applicants' amendment to claim 1 and canceling of claims 33 to 48 should obviate this rejection. The Examiner has acknowledged that the claims as now presented find support in Example 4 of the specification. *See* August 22, 2006 Office Action at page 7, second paragraph, and page 8, first paragraph. Applicants respectfully request the Examiner withdraw the rejection for lack of written description.

**[14] New Matter Rejection of claims 17 to 32—Withdrawn**

Applicants thank the Examiner for withdrawing the rejection of claims 17 to 32 for new matter.

**[15] Rejection of Claims 7, 16 and 39—New Matter**

The Examiner has maintained the rejection of claims 7, 16 and 39 for new matter. The Examiner has acknowledged that "Figure 2 of the '832 patent shows the effects of specific mutations within the sequence of SEQ ID NO:1 on catalytic activity as a function of temperature over a defined temperature range [but does not support] the broader genus of mutants of claims 7 and 39." August 22, 2006 Office Action at 11, first paragraph. Applicants respectfully submit the present amendment to claim 1 obviates the pending rejection of claims 7 and 16. Applicants have canceled claim 39. In view of Applicants' amendment of claim 1 and cancellation of claim 39, Applicants respectfully request the Examiner withdraw the rejection of claims 7, 16 and 39.

**[16] Rejection of Claims 1-7, 10, 15-16, 33-39, 42 and 47-48—Written Description**

The Examiner has maintained the rejection of claims 1 to 7, 10 and 15 to 16 and has included claims 33 to 39, 42 and 47 to 48 in the rejection. Applicants respectfully submit the

present amendment to claim 1 and cancellation of claims 10, 33 to 39, 42 and 47 to 48 obviate the rejection. The Examiner has acknowledged that the specification discloses the subject matter of claim 1 as amended. *See* August 22, 2006 Office Action at 13, lines 3-5. In view of the amendment of claim 1 and cancellation of claims 10, 33 to 39, 42 and 47 to 48, Applicants respectfully request the Examiner withdraw the pending rejection.

**[17] Enablement Rejection of Claims 8-9, 11-13, 24-25 and 27-29—Withdrawn**

Applicants thank the Examiner for withdrawing the rejection of claims 8, 9, 11 to 13, 24, 25 and 27 to 29 for lack of enablement.

**[18] Rejection of Claims 1-7, 10, 14-16, 33-39, 42 and 46-48—Enablement**

The Examiner has maintained the rejection of claims 1 to 7, 10, 14 to 16, 33 to 39, 42 and 46 to 48 for failure of enablement. The Examiner argues that the claims are not enabled for “any mutant prenyl diphosphate synthase polypeptide having the ability to produce any prenyl diphosphate in a greater amount relative to wild-type and having any additional mutation outside of the structural features as recited in lines 3-16 of claims 1 and 33.” August 22, 2006 Office Action at 16. Applicants respectfully submit the amendment to claim 1 and cancellation of claim 33 (and claims 33 to 39, 42 and 46 to 48) obviate this rejection. As such, Applicants respectfully request the rejection be withdrawn.

**[19] Provisional Rejection of Claims 1-10 and 33-42—Double Patenting over US 5,807,725**

The Examiner has maintained the double patenting rejection of claims 1 to 10 and 33 to 42 over claims 1 and 4 of US 5,807,725. Applicants respectfully submit claim 1 as amended is not obvious over claims 1 and 4 of US 5,807,725 because claims 1 and 4 of US 5,807,725 fail to provide any suggestions or guidance to the specific amino acid modifications recited in the instant claim 1. As such, Applicants respectfully request the provisional double patenting rejection be withdrawn.

**[20] Provisional Rejection of Claims 11 and 13-15—Double Patenting over US 5,882,909**

The Examiner has maintained the double patenting rejection of claims 11 and 13 to 15 over claims 1 to 4 of US 5,882,909. Applicants respectfully submit claim 1 as amended is not obvious over claims 1 to 4 of US 5,882,909 because claims 1 to 4 of US 5,882,909 do not suggest a DNA encoding the mutant prenyl diphosphate synthase comprising the specific amino

acid modifications recited in the instant claim 1. As such, Applicants respectfully request the provisional double patenting rejection be withdrawn.

### **New Independent Claims 54, 58, 62 and 63**

Applicants have added new independent claims 54, 58, 62 and 63. Claims 54 and 62 correspond to claim 1 as presented in the Amendment with RCE filed June 2, 2006. Claims 58 and 63 correspond to claim 33 in the Amendment with RCE filed June 2, 2006. Applicants respectfully submit that new claims 54 and 62 and new claims 58 and 63 carefully respond to the rejection of claims 1 and 33, respectively, provided by the Examiner in the present Office Action.

### **Applicants' Response to the Written Description and Enablement Rejection of Claims 1 and 33**

In the presently pending Office Action, the Examiner rejected claims 1 and 33 for lack of written description and enablement because claims 1 and 33 “are not limited to maintaining wild-type sequence outside of the recited structural features” of the claims and “the claims broadly encompass any mutant prenyl diphosphate synthase polypeptide . . . having any additional mutation outside of the structural features as recited in lines 3-16 of claims 1 and 33.” Office Action at 14, first paragraph, and at 16, first paragraph. The Examiner argues that the claims encompass “any amino acid sequence as long as it has the minimal structural features as recited in lines 3-16 of claims 1 and 33” and “[g]iven that art-recognized sequences of prenyl diphosphate synthase polypeptides are approximately 350 amino acids in length . . . such a structural feature as recited in the claims would not be considered to ‘constitute a substantial portion of the genus’ of claimed mutant enzymes.” *Id.* at 13 and 14. The Examiner has further noted that the claims have been interpreted to allow any mutation “outside of the recited structural features” of the claims. *See id.*

Applicants respectfully submit that new claims 54 and 62 and new claims 58 and 63 directly respond to the Examiner’s rejections of claims 1 and 33 in the presently pending Office Action.

### **Claims 54 and 58**

Claims 54 and 58 have been changed from their respective corresponding claims 1 and 33 to clarify that the mutant prenyl diphosphate synthase of the claims are “modified from [the] sequence of [a] wild-type prenyl diphosphate synthase only in the amino acid sequence

beginning at the position five amino acids upstream of said aspartic acid rich domain and ending at the aspartic acid in the position of D<sub>3</sub>.”

This change in the claims clarifies that the mutations within the claimed enzymes are particular modifications within a limited region upstream of and including the aspartic acid rich domain. As such, Applicants respectfully request the Examiner find new claims 54 and 58 allowable.

### **Claims 62 and 63**

Claims 62 and 63 have been changed from their respective corresponding claims 1 and 33 to clarify that the mutant prenyl diphosphate synthase of the claims are modified “only within region II of the amino acid sequence of [the] wild-type prenyl diphosphate synthase” where region II of the wild-type prenyl diphosphate synthase is defined by having 45% homology with the sequence consisting of positions 72 through 93 of SEQ ID NO:1.

This change in claims 62 and 63 clarifies that the mutations within the claimed enzymes are strictly limited to modifications within region II of a wild-type enzyme. As such, Applicants respectfully request the Examiner find new claims 62 and 63 allowable.

### **Applicants' Response to New Matter Rejection of Claims 1 and 33**

The Examiner has also maintained the rejection of claims 1 and 33 for new matter because the disclosure “fails to provide adequate support for the limitations of “wherein said region II . . . is greater than about 25% homologous with the sequence consisting of position 72 through 93 of SEQ ID NO:1” as set forth in the pending claims. Office Action at 7. Applicants have changed claims 54 and 58 from their respective corresponding claims 1 and 33 to clarify that the mutant enzyme sequence is modified only within the sequence beginning 5 amino acids upstream of the aspartic acid rich domain through and including the aspartic acid rich domain itself. Applicants have changed claims 62 and 63 from their respective corresponding claims 1 and 33 to clarify that the mutant enzyme sequence is modified only within region II of a wild-type enzyme sequence. These amendments should obviate the new matter rejection.

Applicants respectfully submit that claims 54 and 58 and claims 62 and 63 carefully respond to the Examiner's new matter rejection.

**Claims 54 and 58**

Applicants respectfully submit that claims 54 and 58 (as presently presented) respond to the Examiner's new matter rejection. Claims 54 and 58 expressly define the modification of the claimed mutant enzyme within the area defined as five amino acids upstream of the aspartic acid-rich domain of a wild-type enzyme through and including the aspartic acid-rich domain. Because the claims define mutations only within the five amino acids upstream of the aspartic acid-rich domain of a wild-type sequence and the aspartic acid-rich domain of the wild-type sequence itself, one of skill in the art would understand from the specification (including, for example, Figure 1 and column 5) that Applicants possessed the precisely prescribed wild-type aspartic acid-rich domain sequences.

One of skill in the art would further be able to easily identify the aspartic acid-rich domain in the sequence of wild-type enzymes using, for example, the 10 wild-type sequences disclosed in Figure 1, Examples 1 through 5 of the specification, and the many wild-type sequences cited by Applicants in column 5, lines 30 through 59 as disclosed in Chen et al., Protein Science, Vol. 3, pp. 600-607, 1994. One of skill in the art would additionally find Applicants possessed the modifications of the wild-type sequences provided in the claims and would easily be able to employ the modifications provided in the claims to arrive at the mutant prenyl diphosphate synthase of the claims by looking at Applicants' disclosed Examples 1 through 5.

**Claims 62 and 63**

Applicants respectfully submit that claims 62 and 63 (as presently presented) also respond to the Examiner's new matter rejection. Applicants respectfully submit claims 62 and 63 expressly define Region II by a wild-type sequence such as the 10 wild-type sequences provided in Figure 1. Because the claims define "Region II" as Region II of the wild-type sequence, one of skill in the art would understand from the specification as filed (including, for example, Figure 1 and column 5) that Applicants possessed wild-type Region II sequences. One of skill in the art would further be able to easily identify Region II in the sequence of wild-type enzymes using, for example, the 10 wild-type sequences disclosed in Figure 1, Examples 1 through 5 of the specification, and the many wild-type sequences cited by Applicants in column 5, lines 30 through 59 as disclosed in Chen *et al.*, Protein Science, Vol. 3, pp. 600-607, 1994.

One of skill in the art would additionally find Applicants possessed the modifications of the wild-type sequences provided in the claims and would easily be able to employ the modifications provided in the claims to arrive at the mutant prenyl diphosphate synthase of the claims by looking at Applicants disclosed Examples 1 through 5.

**Claims 54, 58, 62 and 63 Contain No New Matter**

In sum, one of skill in the art would understand that Applicants possessed the limitations of the claims concerning the aspartic acid-rich domain of a wild-type enzyme and region II of a wild-type enzyme and would understand the claims to define and identify the aspartic acid-rich domain and region II of the sequence of a wild-type enzyme with express modifications prescribed in the claims.

One of skill in the art would further understand that claims 54, 58, 62 and 63 are supported by the specification and are not new matter in that modifications to the wild-type sequences provided in the claims are disclosed at column 5, line 63 through column 6, line 17 as well as in Examples 2 and 4. Applicants respectfully submit, therefore, that claims 54, 58, 62 and 63 fully respond to the Examiner's rejection of claims 1 and 33 for new matter. Because the aspartic acid-rich domain of a wild-type prenyl diphosphate synthase and region II of a wild-type prenyl diphosphate are fully disclosed in the specification and known in the art, and the modifications to a wild-type enzyme prescribed in claims 54, 58, 62 and 63 are fully disclosed in the specification at columns 5 and 6, Applicants respectfully request the Examiner accept claims 54, 58, 62 and 63 as fully disclosed in the specification and definite to one of skill in the art.



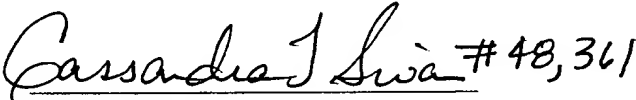
**CONCLUSION**

The claims are believed to be in condition for allowance and Applicants respectfully request the same. The Examiner is invited to contact the undersigned to discuss any issues related to this application.

The Office is authorized to charge any fees, including the extension fee, or credit any overpayment regarding this application to Kenyon & Kenyon LLP **Deposit Account No. 11-0600**.

Respectfully submitted,

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